ACUTE HEMORRHAGIC CORTICAL ENCEPHALITIS.[1]

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The study of the acute non-purulent inflammation of the gray matter of the brain has received much attention during the last decade especially, but so much space and time has been devoted to the subject of the acute hemorrhagic inflammation of the gray matter surrounding the floor of the fourth ventricle, and especially the canal of Sylvius, that the other, far more important study of cortical affections of this character, has been pushed into the background. This in a large measure is, and was, due to the striking picture presented by Wernicke's acute encephalitis hæmorrhagica superior, whereas the cortical form is either frequently mistaken on the one hand for leptomeningitis, acute mania or, occurring as it so frequently does, intercurrent or after an acute infectious disease, is either overlooked or taken for hemorrhage or softening. You will easily recognize the importance of properly diagnosing this disease, not only for a scientific reason, but also because in favorable cases prompt and, in my experience, continuous treatment may effectually remove the pathological condition, and in a measure prevent the remote consequences.

This variety of encephalitis is called by the German authors The Strümpell-Leichtenstern form. Strümpell[2] first directed the attention of the medical world again to this subject by his paper on infantile cerebral palsies, as being frequently caused by encephalitis, and many years before this (1865) Virchow[3] had made exhaustive studies of the pathology of encephalitis of the new born.

In 1885 Leichtenstern described a case of acute non-purulent encephalitis occurring during the course of an epidemic of cerebro-spinal meningitis, and he was the first to call up the thought that the disease was due to an infection. The influenza epidemic of 1889-1891 brought out typical cases. Those of Fürbringer[5] especially, Koenigsdorf[6] and Schmidt[7] deserving special mention.

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[1] Read at the annual meeting of the American Neurological Association, June 5, 6 and 7, 1902.

After the bacteriological origin had been denied by Strümpell, Brickler, Goldscheider and others, although in the typhoid, diphtheritic and other zymotic diseases, streptococci had been found, Pfhul, and especially Nauwerk, by finding Pfeifer's influenza bacillus, were enabled to furnish the proof that the disease was due at times at least to direct bacterial invasion of the brain and not to ptomaine or leucomaine intoxication or to secondary infection.

Oppenheim's monograph on encephalitis in the Nothnagel series, to which I am indebted for most of the above historical data, contains a complete bibliography on the subject, up to 1897.

The etiology of acute hemorrhagic encephalitis of the cortex is usually directly or indirectly bacteriological or zymotic. Either the inflammation is due to the direct invasion of the cortex of the brain by the bacteria which cause the primary disease, as for instance in influenza, where we have positive evidence, or in diphtheria and typhoid, where we surmise, although as yet the bacteria have not been demonstrated; or it is due to the peculiar zymotic agency or the ptomaines of the other acute infectious diseases, when it occurs as a complication of measles, scarlatina, etc.

Whether alcohol, carbonic oxide, ptomaine poisoning from fish or meat, or the other metallic poisons can produce an acute encephalitis of the cortex, as they are supposed to do in the gray matter of the pons or cord, I doubt; alcohol is the most common direct or indirect cause of Wernicke's form of encephalitis. I should, however, feel inclined to place infection and contagion as the primary if not the only cause of encephalitis of the cortex, although in some of the reported cases of Wernicke's disease, 15 in all according to von Monakow, the cortex and the gray matter of the basilar ganglia have been involved occasionally.

Sexes are equally often affected. If all the cases were published I have no doubt that early childhood up to puberty would be found to be most frequently affected, principally because the acute infectious diseases are most frequently found at this period of life. Most reported cases are found in adults. General weakness and loss of strength do not seem to be predisposing causes, for, like cerebro-spinal meningitis, primary encephalitis is very frequently seen to attack strong, sturdy, robust individuals, previously healthy. The amount of general exhaustion during the course of an infectious or contagious disease does not seem to bear any relation to the probability of an intercurrent or subsequent encephalitis. Encephalitis of the cortex is most frequently seen during the course of influenza epidemics. During such epidemics primary encephalitis is frequently seen, where the influenza attacks the brain alone; or, to express it more appropriately, the predominating symptoms are on part of the brain, with an absence of respiratory or intestinal symptoms. Encephalitis may occur during an attack of ordinary influenza, or it may follow, either in the course of a few days, or even after weeks or months.

Encephalitis, Lichtenheim's celebrated case, may occur during an epidemic of cerebro-spinal meningitis without any involvement whatever of the meninges. Of the acute infectious diseases I should say that measles is most frequently complicated with encephalitis, next in order typhoid, scarlatina and diphtheria. In these diseases it usually occurs when the disease itself is on the wane, or during convalescence.

Trauma is a frequent cause of acute hemorrhagic encephalitis, and in a twofold way, first in a purely mechanical way. The brain is either bruised by concussion and then a reaction of inflammatory softening occurs, or without any fracture whatever the bruised brain cortex becomes the seat of a circulatory infection; micrococci or spalt-piltze, which are circulating in the blood, are deposited and set up an inflammation in the bruised spot.

Pathological Anatomy—Viewed in its relation to the immediate and remote effects of encephalitis, the pathological anatomy can be considered from two standpoints, the acute stage and the residual stage.

The most frequent form of acute encephalitis in the cortex, as well as in the gray matter around the canal of Sylvius, is the acute hemorrhagic form according to Fürbringer, who, to my knowledge, at least, described the first cortical cases. The macroscopic appearance of encephalitis is that of circumscribed areas varying in size from a pinhead to a silver dollar; multiple, rarely single, and often symmetrical in distribution, as case No. I will show. These areas are most frequently met in the cortex, but are found also in the white matter of the basilar ganglion. They are bright red in color in the recent cases, but the color varies as the blood pigment changes in color, to a purple-brown, yellowish-brown, or yellow, the area is more succulent than the surrounding tissue, because it is infiltrated with serum, and is slightly raised above the general level of the surrounding cortex and, macroscopically at least, the margins are somewhat sharply defined. Microscopically there is a dilatation of the arterioles and capillaries, and transudation of red and white blood corpuscles into the surrounding tissue, and later on pigment particles, phagocytes and an increase of the spindle cells.

Like unto anterior poliomyelitis the disease is, by concensus of opinion, supposed to be vascular in its origin. What is more interesting to us as neurologists is the fate of the nerve elements, cells and fibers in the area of this acute inflammation. The ganglionic cells are affected, but only secondarily, the protoplasm becomes swollen, more translucent, the nucleus less distinct, afterward the cells become more opaque, and at times the protoplasm is seen to break up, and there seems at times to be a total destruction of cells, at others the cells shrink, become deformed and the nucleus becomes crenated. But this is not a parenchymatous process, but is interstitial in its nature. Aside from the hemorrhagic form Oppenheim has described a yellow or white inflammation in which the macroscopic appearance shows an absence of the engorgement of the arterioles and capillaries, and an absence of the transudation of the red blood corpuscles. In other respects the microscopic anatomy is the same.

The above processes, both the hemorrhagic and non-hemorrhagic may terminte in a complete *restitutio ad integrum.* This is shown not only by the clinical cases in which there has been a complete recovery from all symptoms, but more satisfactorily by the case observed by Oppenheim. This case was that of a young girl who completely recovered from an attack of encephalitis and died six months later of another disease. The autopsy made by Oppenheim showed a complete absence of all traces of the former encephalitis.

Far more frequently, in the favorable cases which terminate in recovery, some defect of the cortex is found which is the cause of either the incomplete recovery from paresis or of the subsequent development of epilepsy.

The first of these defects is the formation of scar tissue which is seen very frequently. Nerve fibers, especially tangential fibers, are involved in the scar according to a case reported by Buchler. Strümpell contends that the cortical scars seen in children's palsy are due to this form of encephalitis. The second is the formation of cysts. Cortical brain tissue shows a variation in its reaction to inflammation, from the other tissues of the body. In the latter the tendency is to form scars. In the brain the opposite often occurs, cysts being formed, which frequently enlarge by a continuous breaking down of their walls.

In this connection I wish to report a case because, in my mind, it shows what the end state of acute hemorrhagic encephalitis may be, although the early history of the case is lacking and cannot be had.

The patient was brought into the Cincinnati Hospital with the history of having fallen down a flight of steps during an epileptic seizure. He was unconscious and presented hemiplegia of the left side of body, with great rigidity of muscles. The diagnosis of surface hemorrhage was made, the patient was operated upon and obtained relief for a few hours, but subsequently died.

Autopsy—Excessive hyperemia present over surface of both hemispheres. Punctate hemorrhages are seen over surface of both hemispheres, varying in size from a pinhead to a split pea. (Probably of recent origin.)

On the tip of frontal convolution of each side there is a dark spot, about the size of a dime. On section the dark spot is found to be the outer wall of a cyst cavity of about the size of a hazel nut. The wall at one side is thicker and appears laminated. The fluid contents are dark brown in color.

The tempero-sphenoidal lobe on right side shows a similar cyst, but it has ruptured, causing a laceration of the surrounding tissue to size of a hen's egg, and extending to internal capsule, with a large extravasated blood clot. Four other cysts were found on the surface of both hemispheres; all of about the same size. The wall of these cysts are yellowish-brown in color, soft in consistency, in state of disintegration. Fresh hemorrhagic spots are seen in the walls. The surrounding tissue appears soft, granular and infiltrated. The cavities are conical, with apex toward cortex; around the apex there is a laminated structure, dark-brown in color, which microscopically is shown to be an old blood clot.

The pia mater is adherent over some of the cysts. Microscopically there is found in the wall granular debris, leucocytes, a few red blood corpuscles, disintegrated ganglionic cells, giant cells, very little connective tissue.

I have no doubt in my own mind that these hemorrhagic cysts had their origin in acute hemorrhagic encephalitis. This opinion is backed up by Bergmann in a paragraph devoted to the discussion of the treatment of Strümpell's form of porencephalitic defects, in which he speaks of the possibility of these late permanent cysts which occasionally follow encephalitis being the cause of cortical epilepsy and therefore objects of surgical interference. Starr, in "Brain Surgery," publishes a similar case, and Henschen and Dahlgren have collected 17 cases of a similar character which have been operated upon.

That multiple sclerosis may be the late stage of encephalitis is a possibility, but that the clinical disease which we know under this name is the same, is very much doubted, the concensus of opinion being that it is a disease of different origin.

Oppenheim calls attention to the fact that encephalitis is frequently associated with sinus thrombosis and thrombosis of veins, but usually in cases in which clinically there was a well-marked chlorosis.

The clinical history is best illustrated by the following cases:

Case II—Mrs. M., married, mother of four grown children, no miscarriages, has always been well, strong and sturdy. Present trouble began by sudden fainting spell. Dr. C., with whom I saw the case in consultation, found patient in state of extreme collapse, pale, blanched lips, no radial pulse, heart's action very feeble and rapid; no rise of temperature, stimulants were administered and the collapse passed off, and patient, though weak and with a headache, passed several comfortable hours, when a second collapse set in with same characteristics as first. This lasted but half an hour, and on a return of the circulation patient appeared not only delirious but almost wildly maniacal. She remained in this condition all night and was seen by me on the following morning.

Examination—Sturdy, well-developed woman, 40 years of age, good, healthy nutrition. Mental condition—patient had been very restless all night—constantly attempts to rise in response to idea of going somewhere, going home; answers imaginary voices which she locates as coming from ceiling or the far corner of room, murmurs and talks to herself. Has very few rational intervals; during these she answers questions intelligently, can be aroused to recognize nurse and doctor and her general surroundings. The mental condition, in a few words, was characterized by extreme restlessness, delirium, hallucinations, visual and aural, reactive talk to these hallucinations, and sleeplessness. Pulse 100 to 110, weak, thread-like; temperature 102 to 104; no complaints of pain or headache, no rigidity of muscles, no retraction of head, no opisthotonos. Pupils normal in size, react to light. External muscles normal. Slight paresis of right side of face and tongue. Sensation to touch and pain normal. Upper and lower extremities weak, reflexes normal. No ankle-clonus. Kernig's sign is absent. No Babinski. Passes urine and feces in bed.

The violent delirium occurred at intervals for the first week; during the quiescent period patient was semi-comatose, after third day was no longer rational. The fever continued for the first week; at no time was there rigidity or opisthotonos; after first week there was muttering delirium of a low character, marked weakness of both arms and legs. Patient died on the 14th day. No autopsy.

Case No. III—Henry W. M., *aet.* 46, was admitted to "L" neurological of Cincinnati Hospital on April 27, 1898. Discharged May 28. Occupation, carriage maker. Is unable to give any account of himself. No evidence of syphilis. Family state that his illness began ten days ago with headache, dizziness and general malaise. Was treated at first for typhoid. Delirium began a week before his admission.

Present History—Patient was admitted in a state of delirium, muttering in character, with great restlessness, jactilation, fingering of sheets, constant attempt to raise himself with desire to get out of bed, but with an inability to do so on account of general weakness. There is more or less somnolence, with an inability to comprehend questions because his attention cannot be fixed. Seems to have constant aural and visual hallucinations. Temperature normal. Pulse 102, weak, small.

Examination—Mental condition as above. No involvement of pupils. Ophthalmoscopic examination cannot be made. Examination of muscles of eyes normal. No facial paresis. On account of delirium and inattention, unable to say accurately whether there are any sensory disturbances.

Muscular power diminished all over without any marked localized paresis. Tendon reflexes present. Passes urine and feces involuntarily. After three or four days the delirium became less marked, patient has lucid intervals, and during these it has been found that he has a well marked amnesic aphasia with paraphasia.

May 24—Condition has cleared up entirely as far as sensorium is concerned. Has no delirium, no hallucinations, can understand what is spoken, also reads intelligently. Amnesic aphasia and paraphasia well marked.

May 28—Is able to walk out of hospital, amnesic aphasia and paraphasia still present, and existed to a slighter degree three months later, when patient disappeared from view.

Case IV.—Mrs. F., *aet.* 44, married, has 3 grown children, never been seriously sick before. Developed typhoid in March, 1900, ordinary, medium severe case, without any serious complication or malnutrition. During period of febrile decline patient began to complain of headache and vertigo almost at once, not more than a half day elapsing; onset of delirium with hallucinations, especially aural in character, associated with talking in an incoherent manner. The facial expression was that of anxiety and distress, mental in character, an inability to recognize her surroundings. The temperature rose at once to 103, pulse 110. Restlessness, sleeplessness and delirium, together with the high fever, continued for 3 or 4 days. It was noticed that the patient had a difficulty in expressing herself during the state of delirium. After the latter had passed the headache still continued; the patient could be confused very readily by cross-questioning; slightest exertion showed the presence of mental confusion and weakness.

Examination—Mental condition as above, left pupil larger than right, no optic neuritis, both pupils respond to light, no paresis of external muscles of eyes. Slight paresis of lower half of right facial, of right side of tongue and of right arm; right leg not affected. Well-marked amnesic aphasia. Four or five days later the delirium passed away; the amnesic aphasia however continued. The aphasia gradually improved, but never disappeared completely. The difference in pupils also remained.

May, 1901—Patient has had an epileptic seizure. Those who were with her are unable to tell anything more than that the convulsion was general in character and followed by deep coma and sleep. When I arrived an hour later patient remembered nothing of her attack and does not know whether it began in the right arm or face. Patient has been under constant treatment since then and has not had another attack.

The above case is characterized by the mildness of the general symptoms, the rapid disappearance of the delirium and the great local damage done to cortex, viz.: the aphasia, which never disappeared entirely, and the secondary epilepsy.

I have selected the above cases as typical cases, but I would like to call the attention of this Association to another group of cases which we see frequently and of which the following is a type.

Case V.—Mary W., *aet.* 15, third child, parents healthy, has never been sick before. Was called in consultation by Dr. B. on account of the development of violent delirium during the third week of a bad case of typhoid. On account of the presence of a very weak heart, and the refusal to take nourishing food, large doses of whiskey were given, together with a 1-40 gr. of strych. sulph., 4 or 5 times a day, the average quantity of whiskey taken during the 4 hours for one week previous to the outbreak of the delirium being 1½ pints. The condition of patient resembled an acute attack of delirium tremens very closely. The delirium was violent, hallucinations massive, no ability to recognize parents or surroundings. Restlessness, tossing, insomnia.

Examination—Girl well developed, strong muscular system, somewhat emaciated, mental condition as described above. Pupils and external muscles of eyes normal. No defect of muscular system or sensation in any part of body. This delirium lasted with more or less severity for a week, but gradually became less and less intense, being displaced by an increased tendency to somnolence and sopor, which state continued for another week without actually passing into stupor or coma. Temperature all this time 102 to 103. Pulse rapid and weak. Respirations rapid, no opisthotonos. Then a gradual return to consciousness with a gradual increase in the amount of food taken, and after 4 or 5 weeks the consciousness became normal and was followed by complete mental and physical recovery, and after five years patient is still strong, vigorous and active.

In another case of this character the stupor lasted for 3 or 4 weeks after the delirium had passed away, and also ended in recovery.

You will see at a glance that the last mentioned cases are not febrile psychoses. I wish merely to call your attention to this class of cases, making only a hypothetical diagnosis, in the absence of localizing signs, placing the seat of the encephalitis in the frontal lobes, terminating in a complete recovery of the tissue.

The assumption of an encephalitis for the explanation of these cases is strengthened by the experience which we have of the large number of so-calld febrile psychoses which end in incomplete mental recovery, namely, the recovery with mental defect of various grades.

SYMPTOMATOLOGY.

As clearly seen from the foregoing cases, the symptomatology is varied, but the numerous signs and symptoms can easily be grouped under three heads, or rather into three periods, in chronological order, namely: The period of onset and development; (2) the period of focal signs and symptoms; (3) the permanent signs and remote consequences.

The first and second group overlap each other more or less, but are sufficiently distinct to be separated.

The general symptoms may be preceded by indistinct prodromal symptoms for a day or two, such as headache, vertigo, general malaise, but as a rule the onset is sudden, rarely with a chill, usually with a high fever or the exacerbation of a previously existing fever, and there is rapid development of the mental symptoms and the climax is reached in from 24 hours to four or five days or a week. The developed mental symptoms resemble very closely an attack of acute delirium tremens, so much so that Wernicke, who recognizes chronic alcoholism as the most potent factor of encephalitis hæmorrhagica superior, at first was inclined to attribute the mental characteristics to chronic alcoholism rather than to encephalitis. Boedker showed however that this mental state occurred in encephalitis of the cortex without there being any evidence of chronic alcoholism.

Case No. III illustrates perhaps best the general signs of the acute violent form of cortical encephalitis. The cortical form usually affects adults as often as children. The onset in primary encephalitis is usually sudden, with headache and vertigo and a sense of general malaise. A chill, sometimes, though not often, ushers in the rise of temperature, which is at once high, 102 to 104, with rapid, small pulse. Restlessness and a desire to move about and not lie quiet precedes the delirium; collapse, as seen in Case No. II, is not a frequent manifestation. After the development of the delirium, nearly all cases present the same manifestations, the differences in my experience being one of degree and not character. Restlessness, jactilation, sleeplessness, hallucinations both aural and ocular, together with those of general sensation, keep the patient on the alert. Frequently there is a constant muttering of incoherent sentences, but not infrequently there is a response to the aural or ocular hallucinations, calling to supposed friends, answering voices which they hear; frequently maniacal character of movements or speech, constant rambling conversation, smoothing bed sheets, picking at bed clothes, removal of imaginary bugs. In the course of from 2 to 5 days the delirium gradually subsides, the hallucinations and responses to them are not so clearly defined, the speech becomes muttering and incoherent, the acuteness of the fire being smoldered by a blanket of increasing somnolence. The patient frequently becomes lucid at intervals, answers questions promptly, and correctly, but these intervals last only a very short time. During all these days the temperature is high, and the pulse rapid, the breathing is rapid and superficial, there is no, or very little, retraction of the head, though opisthotonos does at times occur, herpes does not develop, and there is no eruption on the body. Sordes of lips and teeth are marked. As a rule there is no change in the pupillary reaction, although in some cases there is an inequality, light reaction usually present, at times absent. Choked disc is always absent in the cortical form, external muscles of the eyes are not involved. Reflexes vary, sometimes normal, sometimes abnormal; some cases are ushered in by general or unilateral convulsions especially in children. In the very violent cases sopor and coma set in and mark most of the localizing symptoms. In the milder cases improvement usually sets in before the somnolence becomes very marked. In the state of coma there is an involuntary discharge of feces, retention and incontinence of urine, and at times bedsores. Death occurs from exhaustion. In those cases which develop during the course of one of the febrile diseases, there is a sudden exacerbation of fever, the pulse becomes rapid, the patient complains of headache and dizziness, and then almost at once, at least in a few hours, the delirium sets in and the above symptoms may all be developed; or the disease runs a milder course, with delirium, restlessness, insomnia, together with the hallucinations and muttering.

During the course of the delirium, in some cases before it reaches its height, in others after the somnolence has set in, the second group of symptoms is developed. Whether or not these continuous cases of delirium and coma, as illustrated by case No. V. may be looked upon as a manifestation of frontal encephalitis, remains to be seen by future pathological observation. The onset is very sudden, but paralysis is rarely complete, or if it is complete it very rapidly improves during the course of the first few days.

Aphasia, both motor and amnesic, and paraphasia, are seen very frequently as focal symptoms of encephalitis.

In favorable cases the general symptoms clear up, the sensorium becomes free after 2 to 3 weeks, intelligence gradually returns. The focal symptoms, however, remain for some time longer. They may completely disappear in the course of weeks or months, or there may be a permanent defect; and this leads us to the third stage, which is not present in those cases in which the recovery from the inflammation has been complete. The paresis which remains is more or less spastic in character. Contractures, with a retardation in general development, is seen frequently in the cerebral palsies of children.

In adults the paresis may manifest itself as a slight weakness and awkwardness of the arm or leg or entire side.

My experience with the aphasia in both cases, was that the speech showed some defect even a long time afterward.

The most serious of all the sequelæ, however, is the development of epilepsy, as illustrated by Case IV, either Jacksonian, which is usual, or general, which is the exception.

Course, Duration and Termination—The course of acute non-purulent encephalitis of the cortex is that of the ordinary acute infectious disease. Fever is at times absent, but usually a high fever, and all the characteristics of the onset of an acute infectious disease, mark the beginning. The main symptoms of the entire disease show the involvement of the sensorium, viz., the acute delirium, restlessness, insomnia, hallucinations, followed by progressive somnolence and sopor, and finally coma, show at once the seat of the disease to be in the cortex. The height of the disease is usually reached in 3 to 4 days; then the mental excitement gradually subsides.

Even during the delirium, most frequently during the somnolence, the focal signs make their appearance. After 10 to 12 days the case may end fatally; or improvement takes place, and in a week the sensorium is clear and the focal signs are already waning. Cases are on record in which death has taken place within 24 hours, in other cases in 3 to 4 days; the ordinary duration of the primary acute cortical encephalitis is from 2 to 4 weeks. Those which complicate acute febrile diseases are somewhat shorter, but only apparently because the convalescence of the two diseases is merged together. When death occurs in encephalitis it is due either to the shock of the onset or to ptomaine poisoning in the very acute stages, or is often due to the spread of the disease to vital centers, death occurring most frequently as a result of the involvement directly by inflammatory process of the respiratory or cardiac centers, or of the associating fibers connecting the latter center with the cortex.

In cases which run a favorable course the coma scarcely ever supervenes, even the sopor does not become profound, the case continues for some days, even a week, in a state of mild delirium, with moderate fever and a rapid pulse; when the fever and delirium subside the sensorium becomes clear; the patient shows mental confusion, does not remember clearly the events of the foregoing days; nothing remains aside from this but great exhaustion and the focal signs, which gradually diminish.

Prognosis—In the early stage of our knowledge of encephalitis it was looked upon as almost invariably fatal, but with a broader knowledge of diagnosis, it has been found that the disease very often runs a favorable course, especially where it occurs as a sequela or complication of typhoid or the acute infectious diseases. Pathologically we can have one of three sequelæ, either complete restitution, or the formation of a scar, or cyst. The first is interesting, and has been proven as a possibility by Oppenheim's case. Second and third occur as either the causes of the permanence of the focal signs or what is equally, if not more important, the causes of subsequent Jacksonian or general epilepsy, and the above data culled from the pathology of the affection is borne out by the clinical data at our disposal. In recovered cases the mental condition is usually good. There may be some of the forms of aphasia, which may lead us to suspect an apparent mental defect. The focal signs usually improve very much. In some cases there is left a slight trace of paresis, and in the two aphasia cases, both of which were amnesic, there was some defect left in speech years afterwards. On the other hand von Jaksch looks upon the prognosis as bad, and doubts the correctness of the diagnosis of the cases which have ended in recovery. In my opinion the prognosis is worse in influenza cases, the result being, as a rule, fatal. My experience is that of Oppenheim, who holds that the prognosis of non-purulent cortical encephalitis is not altogether unfavorable, but at times the disease terminates favorably. Bad prognostic signs are: influenza, rapid onset and short duration of delirium state, with rapid onset of the coma; Cheyne-Stokes respiration, and high temperature. If the delirium is light, the sensorial depression not deep, and the mental symptoms begin to clear up in a few days, the prognosis is good. A very rapid pulse is a bad sign.

The best prognostic indications, therefore, are to be gleaned from the conditions of the sensorium. General conditions must be taken into consideration. During the course of an exhausting disease this general exhaustion may be a bad prognostic sign. But, like epidemic cerebro-spinal meningitis, strong, healthy young individuals may be fatally attacked.

Since von Jaksch is inclined to doubt the accuracy of the diagnosis in the cases with recovery, it behooves us to be very careful in the diagnosis. Oppenheim says that in the vast majority of cases we can only make a problematical diagnosis. We see the importance, therefore, of more exhaustive publication of both clinical and pathological cases.

The diagnosis of the cortical form of encephalitis is much more difficult than that of Wernicke's disease. The differential diagnosis of acute non-purulent cortical encephalitis must be made from abscess, meningitis, uremic focal lesions, cerebro-spinal meningitis and acute mania, hemorrhage and thrombosis. I speak here of the adult form. In children it must be separated from acute gastro-intestinal disturbance. When the trouble occurs as a primary affection or as a sequela, the diagnostic difficulties are most marked. The most important thing is to rule out cerebro-spinal meningitis. The latter disease is usually characterized by the extreme violence of the headache, and the tendency to spastic rigidity of the extremities; the opisthotonos is very marked, there is a spastic condition of arms and legs, and Kernig's sign is never absent. There is present the delirium and high fever, but the maniacal signs are more marked in encephalitis, the headache is not so severe, opisthotonos usually absent, and retraction of the head, if present, is only indicated slightly; symptoms and signs on part of the cranial nerves in lepto-meningitis involving especially the third nerve, facial and lingual, crossed in character, affecting both sides, whereas these are either absent or only present in one group of muscles, and unilateral. I should lay a great deal of stress on the absence of violent headache and the absence of irritability of eyes and ears, especially during state of delirium, and the absence of uniformly exaggerated reflexes in the encephalitis, specially during the delirium or sopor stage. Cerebro-spinal meningitis may occur sporadically, but as a rule in epidemics, whereas primary encephalitis occurs most frequently during the prevalence of grippe epidemics. It may occur as a sequela of some one of the acute diseases, and then we would rather suspect encephalitis than cerebro-spinal meningitis; monoplegia and aphasia are apt to occur during an attack of cerebro-spinal meningitis, but never stand out so prominently, nor do they occur so early, whereas in encephalitis they occur early and assume the most prominent phase. There is no herpes in encephalitis; we would differentiate from uremic focal lesions first and foremost by a careful urinalysis, but since albumin is sometimes absent in uremic cases, other points would have to be considered. Encephalitis, in the adult at least, where uremia might enter most into consideration, is rarely ushered in by a convulsion, whereas convulsions are the most prominent feature and occur in rapid succession in uremia. Uremia, in the early stage at least, occurs without fever; encephalitis corticalis rarely without it. Uremic focal lesions occur sometimes before, but usually during the coma period, and usually disappear with the coma, or in a few hours or days after; whereas in encephalitis the focal lesions do not usually make themselves manifest for 2 to 3 days, and persist for a long time—weeks or even months.

It is most difficult to differentiate between encephalitis and acute mania. This cannot be done sometimes for several days. The presence of a continuous fever speaks for encephalitis; moreover encephalitis makes more of an impression of a severe somatic disease, which makes the patient bedfast and exhausts him; whereas the mania case, at least in the beginning, impresses us as more of a mental and less of a physical disease. The onset of the focal signs place the diagnosis of encephalitis beyond question.

Abscess might cause some trouble, especially in those cases where the encephalitis occurs as a complication of one of the acute infectious diseases. An abscess is very rarely sudden in origin, whereas encephalitis usually is; in encephalitis general symptoms, especially those on part of the sensorium or more marked in abscess usually absent, except in the advanced or final stage. The difficulty can only be present in the early stage of either disease, and not in the later stages, and I would place most stress on the condition of the sensorium. Furthermore, in abscess we almost invariably find some local or distinct focus for pus, or at least a history of some injury, usually recent in date.

Hemorrhage and softening are somewhat difficult to rule out, not in the primary affection, for both hemorrhage and cerebral softening usually occur as sudden attacks without prodromata and fever, especially with the typical alterations of the sensorium. Moreover, encephalitis usually occurs in individuals with normal vessels and arteries.

When encephalitis occurs during or as a sequela of one of the acute infectious diseases, it is always accompanied by an exacerbation of the fever; delirium and hemorrhage or softening which might occur during the same diseases usually are not accompanied by fever or delirium. Oppenheim says that the coma of encephalitis is never deep as that of hemorrhage, and that the pupillary reflex is usually present. Cerebral syphilis is ruled out by the occurrence of a febrile disease.

In the treatment of the cases above, I have used salicylate of sodium in the first few days or weeks; later iodide of potassium and bichloride of mercury.

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[2] Magdeburger Naturforscher Versammlung, 1884.
[3] Virchow's Arch., Bd. 38.
[4] Deutsch. med. Woch., 1885, p. 539.
[5] Deutsche med. Woch., 1892, No. 3.
[6] Deutsche med. Woch., 1892, No. 9.
[7] Deutsche med. Woch., 1892, No. 31.